

The Role and Benefits of Prepacked, Disposable Büchner Funnels in Medicinal Chemistry

Medicinal chemistry is a branch within the pharmaceutical industry that merges expertise in organic, analytical, computational chemistry, and drug metabolism to conceptualize, design, and create novel compounds for potential therapeutic use. Within this research, Flash and HPLC chromatography plays a growing role in purifying and characterizing pharmaceutical candidates for further biological evaluation. However, medicinal chemists are searching yet for simple, reliable, rapid, low-cost methods of achieving separations for a wide range of reaction scales. As a result, packed bed Büchner funnels have received mainstream commission as a simple alternative to flash and other purification techniques. However, most medicinal chemists at this time self-pack reusable ceramic Büchner funnels with the desired adsorbents. Not only is this tedious and time consuming, but also poses a great safety risk for the medicinal chemist. For example, researchers are exposed to respirable particulates during the packing process and large amounts of solvents used to clean the Büchner funnels after use. Also, ceramic Büchner funnels can easily break during use and cleaning. In terms of performance, channeling and bed-weight inconsistency are also major problems when researchers are required to self-pack Büchner funnels. In this report, we will discuss how prepacked disposable Büchner funnels address these issues as well as provide an overview of their use and benefits.

Figure A. Schematic of Prepacked Büchner Funnels



Did You Know...

...Proper pH Selection Will Improve Your SPE Extractions

Documentation

Analysts who have the task of developing cartridge or 96-well SPE applications can improve extractions through proper pH selection. Using pH to modify the form of the analyte can improve its retention, selectivity, and recovery. To improve retention of a basic compound when performing reverse phase SPE, adjust the pH of the sample matrix to at least 2 pH units above the target analyte's pKa. This will neutralize the analyte's basic ionizable functional groups further facilitating the non-polar retention mechanisms associated with reverse phase separations. Subsequent wash step(s) using an aqueous solution in

conjunction with an organic modifier will often remove impurities co-extracted onto the sorbent bed. Increasing the pH of the wash solution can minimize compound loss when stronger wash solutions (higher organic concentration) are required. In contrast, a decrease in pH will aid in the elution of basic compounds of interest. In conclusion, one can dramatically increase extraction efficiency and recoveries by paying close attention to the proper pH selection when developing an SPE method.

For more information request T700002, Instructions for Using Discovery SPE-96 Well Plates.



Prepacked disposable Büchner funnels consist of a 2-piece polypropylene body that is available in a variety of diameters ranging from 55-110mm ID (Figure. A). The lower half of the unit is the funnel itself. The upper half is packed with the sorbent between two polyethylene frits (20-45µm). The porous upper frit helps spread the applied sample across the sorbent bed. Both the polypropylene body and polyethylene frit are resistant to most organic solvents. Unlike self-packed Büchner funnels, the prepacked design contains a heat sealed retaining ring to further compress the sorbent-frit assembly in place. In its compressed state, sorbent channeling is eliminated during use.

Table 1. Common Büchner Funnel Sorbents

Sorbent	Composition	Particle Size
Magnesium Sulfate	MgSO ₄	
Silica (Merck)	SiO ₂	Choices
Silica (Discovery)	SiO ₂	40-60µm
Celite 545 AW	Diatomaceous earth	
Alumina A, B, or N	Al ₂ O ₃	60/325 mesh
Florisil	Mg ₂ SiO ₄	100/120 mesh
Charcoal	C (activated coconut)	20/40 mesh
DPA-6S (polyamide)	Polyamide resin	50-160µm
C-18-Silica	Octadecyl	40-60µm

Table 2. Common Büchner Funnel Applications

Sorbent	Applications
Magnesium Sulfate	Dessiccant
Silica (Merck)	Filtration, polar compound removal, dessiccant
Silica (Discovery)	Filtration
Celite 545 AW	Dessiccant
Alumina A, B, or N	Dessiccant, many specific applications including catalysis, removal of impurities, polar compounds, etc.
Florisil	Many specific applications including isolation of steroidal compounds, antibiotics, purification of pharmaceuticals, decolorization, etc.
Charcoal	Isolation of non-polar compounds, pigments, and dyes
DPA-6S (polyamide)	Tannins, chlorophyll, gallic and humic acids
C-18-Silica	Isolation of non-polar compounds

Table 3. Prepacked Büchner Funnel Capacity and Breakthrough Values

Sorbent	Bed Weight	Analyte	Sample Matrix	Sample Capacity (mg); 2%BKT*
DPA-6S	10g	Phloroglucinol	Water:MeOH (90:10)	240
DSC-Si	12.5g	4-Fluoro-3-nitrobenzoic acid	Methylene chloride	350
Merck Silica	12.5g	4-Fluoro-3-nitrobenzoic acid	Methylene chloride	400
Celite	12.5g	Butyl paraben	Methylene chloride	80
Charcoal	12.5g	Butyl paraben	Water:MeOH (90:10)	104

* Breakthrough is positive for the aliquot with a peak area greater than 2% that of breakthrough standard solution.

Prepacked disposable Büchner funnels are employed for a variety of applications. Silica sorbents are often used in the baseline clean-up of solution-phase synthesis reactions. In such applications, normal phase chromatography is used to retard or retain polar compounds via polar-polar interactions when loaded in the presence of an organic sample matrix. Some researchers have also used prepacked Büchner funnels to isolate active compounds from natural products. Sample dessiccation (dehydrating solvents) and filtration (particulate removal) are also common applications. Büchner funnels are also useful tools for scaling up a variety of SPE applications. Tables 1 and 2 list some of the more common sorbents and applications employed with Büchner funnels. In terms of performance, because Büchner funnels are often used as a purification step, capacity is often a major concern. Table 3 details breakthrough capacity values for some of the more common sorbents and applications employed by Büchner funnels.

In conclusion, prepacked disposable Büchner funnels are a simple, low-cost, rapid, and reliable alternative to flash and other purification techniques. Although Büchner funnels are commonly used in many medicinal chemistry labs, they are often self-packed by the researcher. Because prepacked Büchner funnels are disposable, problems involving both safety (exposure to inhalable particulates and cleaning solvents) and cross-contamination (between applications) are circumvented entirely. The prepacked design also saves the researcher time typically used to pack and clean their own Büchner funnels. Consistent bed weight, compressed sorbent bed, and high capacity levels of prepacked Büchner funnels offer the performance necessary to achieve the many purification objectives required by medicinal chemists.